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LUFTWAFFE DOCTRINE AND AIR SUPERIORITY
THROUGH WORLD WAR TWO

by

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A RESEARCH REPORT SUBMITTED TO THE FACULTY

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ABSTRACT

TITLE: Luftwaffe Doctrine and Air Superiority Through World War Two

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Lessons from World War I and the debates of airpower enthusiasts influenced the development of German air war doctrine during the interwar years. L.Dv.16, Luftkriegsführung (Conduct of the Air War), was developed in the mid thirties and was the Luftwaffe's main doctrinal statement. It remained unchanged throughout the war. Because of its lack of doctrinal prioritization, this manual was not an effective framework for employment of the Luftwaffe during the war. Throughout WWII, Luftwaffe priorities changed frequently, assets were often not concentrated, and the full value of achieving and maintaining air superiority was never appreciated. The brief and dazzling successes in Poland and the west blurred any flaws in doctrine, organization, or operational practice. In the Battle of Britain changing priorities and a failure to achieve air superiority assured the Luftwaffe's defeat. In Russia and North Africa a battle of attrition would begin to take a major toll on the Luftwaffe. Defense of the Reich would attrit qualified pilots, which could not be replaced. The fundamental flaw of the Luftwaffe was that pre-war assumptions remained so strong that real conditions of warfare made little impression.

INTRODUCTION

The Luftwaffe Experience

Aviators today are clear about the importance of air superiority: it is crucial to sustained, effective combat operations. No state has won a war in the face of enemy superiority, no major offensive has succeeded against an opponent who has controlled the air, and no defense has sustained itself against an enemy who had air superiority. (26.10) The context within which it will be used in this paper comes from the JCS Publication 1, Dictionary of Military and Associated Terms, which says, "Air superiority is that degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related air, sea, and land forces at a given time and place without prohibitive interference by the opposing force."

In WWII, the battle for air superiority was not between highly specialized, technologically sophisticated systems and did not render itself to quick resolution. Rather, it was dependent on sustained aircraft production and pilot production, which gave a nation an important strategic flexibility, the opportunity to use aircraft in different ways, and to build up reserves. The nature of the weapon and of air fighting gave the air war an overtly economic core. (20.20) Historian Richard Overy contends that a war fought five years earlier would have resembled the limited combat of WWI, whereas had it been fought 10 years later aircraft were so technically complex and expensive that mass

production of aircraft would have not been possible to the same scale. (20.20)

By the time WWII began, Germany had expended great effort to build a world class air force. Lessons from WWI and the Spanish Civil War, coupled with interwar studies, would impact the development of Luftwaffe doctrine. Ultimately, Luftwaffe doctrine would be less clearly articulated than that of the U.S. Army Air Corps. German military tradition and ideals emphasized operational art, especially the attributes of maneuver and flexibility, and on tactics. The impact of technology and logistics on warfare received less attention. Yet precisely this emphasis on flexibility and the art of warfare resulted in vague doctrine which undermined the principles of concentration and mass in the employment of Luftwaffe assets. This would lead the Luftwaffe into an attrition war of both aircraft and pilots.

The Luftwaffe would prove very adept at changing to operational conditions and at recovering from crippling losses. Still, in the end it would fail to achieve independent, decisive victory, it would fail in its role as a supporting weapon, and it would fail defending Germany's soil. There are two schools when explaining the Luftwaffe's defeat: the externalists and the internalists. (16.x)

Externalists argue that Adolf Hitler's unattainable military and foreign policy goals, and the widening imbalance between Germany's military and industrial power and those of her enemies were the main reason for defeat. Hitler's control over military

decisions and attrition, primarily of experienced pilots, are cited as reasons for the air force's demise. Externalists would argue that even in the days of triumph, the Germans had begun the process of losing the production and technological battle that eventually would decide the conflict. (16.x)

On the other hand the internalists argue that the Luftwaffe went to war with unsound doctrine whose centerpiece was supporting ground forces rather than belief in strategic bombing. When pitted against the Allied Air Forces, who drew the correct lessons from World War I and thus emphasized strategic air operations against the enemy, the Luftwaffe was destined to lose.

The real reasons embody elements of both these arguments. The industrial gap and German emphasis on supporting ground forces are both symptomatic of not realizing the strategic implications of not stressing air superiority.

This paper will evaluate the evolution of Luftwaffe doctrine from 1918 to 1945, focusing on air superiority. Before doing so, it is important to define doctrine as it will be used in this paper.

Doctrine

According to Joint Pub 1, "Military doctrine presents fundamental principles that guide the employment of forces. Doctrine is authoritative but not directive. It provides the distilled insights and wisdom gained from our collective experience with warfare. However, doctrine cannot replace clear thinking or alter a commander's obligation to determine the

proper course of action under the circumstances prevailing at the time of decision."

More simply, "Military doctrine is what we believe about the best way to conduct military affairs." (6.163) Doctrine facilitates communicating a commander's intent, battlefield missions, interservice procedures, and command relationships. Doctrine cuts across all levels of war -strategic, operational (theater), and tactical. It is the thread which links objectives to action. It should be balanced, adaptable, and realistic. Ultimately, doctrine must account for the strengths and weaknesses of sister services (and those of the enemy) in order to optimize the synergistic effect of "joint" combat power. Doctrinal guidelines are effective only if the underlying assumptions are continually reviewed, particularly during the litmus test of war. As we will see, the Luftwaffe failed to objectively review its war experiences and the importance of air superiority until it was too late.

FORMULATING DOCTRINE

World War I

The WWI experience had a major impact on formulation of German strategy and doctrine during the interwar years. Simple attrition of material, manpower, and the national economy through immobile trench warfare was to be avoided at all costs and was to be accomplished by using the Clausewitzian principles of speed and concentration of forces with new weapons systems.

"Blitzkrieg", as it would be coined later, was merely the incorporation of modern armored and tracked vehicles into the Hutier tactics of WWI. These tactics were developed by General Hutier and were utilized in 1918. They were small squads designed to advance on a large front utilizing flexible maneuver, exploiting weak spots and bypassing strong points. (7.20-13)

Another new technology was the airplane. Experience in the First World War had shown that day bombers without fighter escorts were decidedly vulnerable. (10.134) Gotha bomber and Zeppelin raids spread terror in England but caused only very limited damage. German aviators primarily concentrated on close air support of ground operations through observation, artillery, fire-control and tactical employment of fighters and bombers. Air superiority as it emerged from WWI had limited meaning. The range and limited destructive ordnance left much up to the imagination of military thinkers. There was a lack of concrete evidence in the First World War that air superiority would be an essential ingredient of victory. It would be an issue with which

the interwar airpower enthusiasts would wrestle.

Interwar Years

The development of German air doctrine prior to World War II was as creative and ambitious as any other in the world. Germany's continental position exercised the greatest influence over her air strategy. The Germans had to think in terms of land conflict. From the onset of any conflict, the Reich faced the prospect of a major struggle on the ground.

In recognition of this strategic position in Europe, the concept of "Operativer Luftkrieg" (operational air warfare) was developed and embodied integrating an independent air force into fighting a "total war". The key tenet of this concept of air warfare was supporting ground forces. In fact, as late as 1941-1942 there were few other air forces which could provide ground forces with decisive assistance at a critical juncture in the battle. (16.2)

Of the inter war year prophets, only Billy Mitchell argued that fighter support missions were essential to other air operations and stated that the proper aircraft ratio for Air Corps aircraft should be 60% fighter aircraft, 20% bombardment, and 20% reconnaissance. (17.239) Mitchell's ideas in this regard would have little influence on the doctrinal development of the Luftwaffe.

Giulio Douhet, whose treatise Command of the Air was published in 1921, influenced how the Germans thought about airpower. The nucleus of his theory comprises three main ideas:

achieving air superiority, destruction of enemy centers of gravity through large formations of bombers, and the use of airpower to break the will of the people. (5.chIII) German thinkers embraced his ideas of the need for an independent service and importance of control of the air, but viewed his notions regarding the effects of area bombing as overly optimistic. (16.10) He rejected the idea that an enemy air force should be fought in the air, but rather by destroying the collection points, the supply, and the manufacturing centers of enemy aviation. He rejected the notion of specialized fighters to defend against enemy bombers, preferring instead to devote all resources to "battle planes" which could carry out bombardment and be self-defending. These ideas will be reflected in the Luftwaffe throughout much of the war.

The Spanish Civil War, however, highlighted the fact that fighter aircraft would play a crucial role in gaining air superiority. As a result, Ernst Udet, in charge of production by the late 1930s, changed the long run goal for the Luftwaffe's force structure from a ratio between fighters and bombers of 1-3 to a ratio of 1-2. (11.172)

Throughout the immediate prewar period as well as the first few years of WWII, Luftwaffe planning aimed to destroy air forces at the outset of hostilities primarily by strikes against his air bases and forward operating areas and secondly by contesting the air space over the battlefield. (18.55) Fighters played a subordinate role from the start. Bombers were viewed as a

primary asset in the battle to gain air superiority by destroying the enemy air forces on the ground. Primarily, however, the Luftwaffe was viewed as an instrument of attack.

Doctrine Development

The disarmament clauses of the Versailles Treaty effectively restricted aircraft development during the years of the Weimar Republic (1918-1933). Generaloberst Hans von Seeckt, who until 1926 was head of the Truppenamt (effectively, a camouflaged general staff), would have a major influence on Luftwaffe doctrine. (16.4) According to von Seeckt, air attacks on centers of national resistance and sources of military strength could pave the way for a victory on the ground. He espoused command of the air as a prerequisite for these deep interdiction and/or strategic missions. (3.6) Within the Truppenamt, Major Helmuth Wilberg, a close friend of von Seeckt and a WWI airman veteran, was appointed as head of the shadow air staff which would analyze WWI lessons. He would become the leading German air theorist of the 1920s and 1930s. In the two year period 1919-1920, within the air staff at least 48 subcommittees and study groups were formed to study doctrine, unit organization, combat tactics, technical developments, air superiority, air defense, supply, and army support. (4.144)

In 1926 in a document entitled "Guidelines for the Conduct of the Operative Air War" appeared. The fundamental underlying premise articulated in these guidelines was the belief that an effective air defense was not possible. (1.124) Out of this

belief sprouted the necessity for a strong offensive capability. In other words, the best defense is an offense. Paragraph 41 states, "The concept of 'defense' is unknown in air tactics... military forces and civilians must understand that the overflight of their own country cannot be avoided." (1.124) This philosophy is taken directly from Douhet, where he states, "We must therefore resign ourselves to the offensives the enemy inflicts upon us, while striving to put all our resources to work to inflict even heavier ones upon him." (5.55) An independent air force operating in mass, inflicting the greatest possible damage in the shortest possible time, was the way to achieve this. (5.49-51)

In 1931 the Reichswehr tactical manual, Die Truppenfuhrung, did not tie the air force to army support tasks. Rather, it emphasized that bomber unit's primary tasks are to attack enemy combat power, sources of supply, and economic sources of power (Wirtschaftliche Kraftquellen). (2.78) Airpower doctrine would be codified in 1935 in a document entitled L.Dv.16 Luftkriegfuhrung (Conduct of the Air War). This document would remain unchanged throughout the war. L.Dv.16

First mentioned in the 1926 Guidelines, the concept of "operational" air war is cemented in L.Dv.16 Luftkriegfuhrung (Conduct of the Air War). General Walther Wever, first Chief of the Luftwaffe General Staff of the newly created Reich Air Ministry, spearheaded the effort along with General Wilberg and

Major Paul Deichmann. Wever was an army officer whose professional association with aviation began in 1933. Fellow officers viewed him a German Douhet. (8.14)

The manual addresses the conduct of the air war within the context of overall war objectives (Gesamtkrieg). It is broad in scope, covering such subjects as airpower objectives, leadership, and tactical execution at the unit level. Superficial discussion on logistics and other support functions and organization conveys an image of incompleteness. On the other hand, the offensive use of airpower receives clear emphasis. Of the 280 paragraphs, 158 deal with offensive air war. In the chapter entitled Employment, 63 out of 90 paragraphs are offensive in nature. Conversely, defensive employment is addressed in only 35 paragraphs in the entire manual. The following main tasks are assigned: (14.par10)

- To combat the enemy air force, thereby weakening the enemy's armed forces while at the same time protecting our people and homeland

- To directly support army and naval forces by taking part in operations and combat on land and on the sea

- To attack the sources of power of the enemy's armed forces (strategic centers of gravity) and interrupt the flow of supplies to the front (interdiction)

Importantly, there are no priorities assigned to these missions. Rather, they are to be thought of in terms of the Gesamtkrieg or overall war picture. At any given time, weight of effort could shift depending on what was required relative to the

total war effort.

The task of attacking the enemy's air force should be initiated from the outset of the war. He should be destroyed on the ground when possible. The earlier the air force is defeated, the sooner friendly air assets can be used against "more important" targets. (14.par103) Paragraph 2 of Luftkriegsführung states, "Our own army and homeland are under constant threat by the enemy air force. This danger cannot be addressed solely through air defenses. The danger to our homeland pressures from the outset of war offensive operations against the enemy air forces in enemy territory." Paragraph 127: "The framework of co-operation with the Army must not form too narrow a context. Attacks against distant targets, such as enemy air forces on their airfields, transport movements and communications, may be necessary, as well as attacks on a zone closer to the front."

There is no mention of the necessity for a separate offensive counter-air campaign prior to attacking other targets. Although mastery of the air is considered essential for victory, the effort to achieve this can be undertaken concurrently with other missions. In essence, the quest for air superiority was simply part of the concept of Operativer Luftkrieg. This concept was applied to a number of air force missions and could be used in virtually any context. This is illustrated by the following quote from German historian Horst Boog: (16.10)

"The Bomber Chief of the Operations Department of the Luftwaffe General Staff, Major Deichmann, told me that when in 1936 he called together all General Staff officers and made them write down their definition of the concept...he got as many

definitions and interpretations as there were officers present."

The lack of clear-cut doctrinal priorities and ambiguities associated with the concept of operational air war were weaknesses which would manifest themselves throughout World War II.

WORLD WAR II

Poland

The Luftwaffe planned to open the campaign with a decisive strike against the Polish Air Force in order to attain air superiority and prevent attacks against German soil. (21.10) The objective was to strike bases in order to catch planes on the ground and destroy support facilities, thereby preventing the Polish Air Force from taking part in any effective air operations. Once attained, attention would be turned to supporting the two army groups and attacks against military installations and armament factories. On the eve of the invasion, the Luftwaffe consisted of nearly 4,000 aircraft, of which only 700 were fighters. (25.194) Of these, 870 bombers, 210 fighters and about 750 support aircraft would be used. (25.194) The Polish Air Force consisted of about 400 first line operational aircraft (154 bombers and 159 fighters in 43 squadrons). (13.54) Despite the onslaught, the Polish Air Force remained largely intact and was not destroyed on the ground during initial attacks. (9.132) The Luftwaffe faced several difficulties in its effort to destroy the Polish Air Force. The weather on September 1 was very poor, allowing only one third of the effective force to take off. More importantly, although the Luftwaffe attacked nine of the twelve main airfields, only Warsaw-Okiece had a sizable number of planes. (13.56) Nineteen secondary fields were attacked with little success. Polish fighters and air defenses did rise to challenge the Luftwaffe

until September 16. Luftwaffe losses were 285 aircraft, roughly 19% of its available forces. (13.59) Ultimately, poor communications prevented the polish air command from organizing its air assets into a coordinated defense.

In a preview of what was to come in Luftwaffe operations, Chief of Staff General Jeschonnek gave vacillating and contradictory operational orders, often directly to units without informing the air fleet commanders.

The Germans had achieved air superiority at the end of the first day. However, the Luftwaffe waged war against a weaker enemy and the duration of the conflict was short. Due to rapidly moving ground forces and successes against the enemy air force, the results were never really in question.

However, because of the success of the Luftwaffe's campaign in Poland, the effect of diluting Luftwaffe effort (attacking factories and cities while still fighting for air superiority) and the difficulties in destroying an enemy air force on the ground, were lost on a delirious victor.

Western Campaign

The war against Poland was but a precursor of how the German assault in the west would unfold. In the spring of 1940, the French were ill-prepared to deal effectively with a German invasion, due primarily to a poor communications network and an early warning system comprised of six British radar sites located along the Franco-Belgian border. (13.63) Committed Luftwaffe forces on the eve of the attack were about 1300 bombers. 380 dive

bombers, as well as 1210 fighters. The French Air Force possessed 500 fighters, but few were equal to the ME-109. Without ground radar, it was difficult to direct defense fighters to the enemy.

The Low Countries fared little better. On May 11, one day after conflict began against the Dutch, the Luftwaffe had achieved air superiority. A small, obsolete air force with little warning of the enemy's intent was no match for the German Air Force. It was the inadequate size of its air force and confusion in command and control which gave the Luftwaffe and thus the Wehrmacht, free reign.

The scenario was much the same as the campaign developed through Belgium and France. The Allies put themselves in a decided disadvantage in the battle for air superiority when the commander-in-Chief, General Maurice G. Gamelin, forbade air attacks across the German border through the entire first day of the assault. (13.70) On the other hand, the Luftwaffe attacked at least 75 British and French airfields. (13.71)

The Luftwaffe encountered its own problems. To keep pace with the ground forces, German air elements moved forward so quickly that they often outran their own support. Often, only half the fighters and Stukas could fly at one time. Still, the shock of the German's mobile tactics soon found allied forces retreating toward Dunkirk. By May 23, the last of the allied air component had retreated across the channel to cover the Dunkirk embarkation. Although the Luftwaffe attacked the staging bases

in Great Britain, they could not prevent the British fighter patrols from gaining localized air superiority over the Dunkirk beaches.

A contributing factor to the Luftwaffe success was the absence of a common plan uniting French, British, Belgian, and Dutch armed forces. The restriction on bombing German air bases negated any possibility of a successful counterair campaign.

The lessons drawn were very similar to those in Poland. A time-constrained war with highly mobile ground forces and an inferior enemy air force quickly facilitated the attainment of air superiority and subsequent support of the ground forces.

The Luftwaffe did possess sufficient aircraft to achieve air superiority within the framework of Central Europe. However, the leadership was ill-prepared to conceptualize the problems associated with attempting to gain and maintain air superiority on a continental scale. Inability to successfully British fighter bases and thus yield air superiority over the Dunkirk beaches should have been a clear warning about the upcoming Battle of Britain.

Battle of Britain

On the eve of the Battle of Britain, the three German air fleets opposite the RAF had a decided advantage of numbers and at least technical equality. Air Chief Marshal Hugh Dowding, Commander in Chief, Air Defense of Great Britain, adopted a defensive strategy with the objective of keeping his bases and command system fully operational. The German single engine Me-

109, so effective against Poland and the Low countries, only possessed a 10-20 minute loiter time over the U.K. (13.77) The real test, then, would be how well the RAF fared against the attacking bombers. Indeed, German escort fighters could be ignored by well directed interceptors because they would have to turn back. The most intense activity occurred between August 13 and September 15, 1940. Goering's Luftwaffe repeatedly attacked the RAF's main fighter bases until mid September, when the emphasis shifted to the cities to terrorize the British population into submission. The Luftwaffe was confronted with the most sophisticated, best coordinated command and control system encountered to date. The structure allowed the British to allocate specific squadrons to meet the incoming German threat, thereby conserving fighter forces.

The Germans, convinced the British air forces could be subdued in short order, had not mobilized its war industry and thus had trouble replacing aircraft, and more importantly, pilot losses in the six week campaign. Most sources agree that the RAF was on the brink of defeat when the Luftwaffe shifted to the terror bombing campaign. A fundamental error was to begin a bombing campaign at the expense of achieving air superiority over the RAF, resulting in a battle of attrition which the Luftwaffe would lose. Overall, for the 16 week period, the RAF lost 2306 aircraft of all type while the German Air Force lost 2721. (23.9)

The strategic framework of the Battle of Britain was so radically different from what the Germans were used to that they

never fully grasped the immense cost involved in trying to gain air superiority over an enemy with the resources and depth to fight an independent air war.

North Africa

Before the arrival of American forces, the battle for air superiority was fierce but indecisive. According to Air Marshal Arthur Tedder, British Commander in the Middle East, one of the main reasons was the German's ability to operate from "secure" bases in Greece and Crete. (13.140) The Allies might have taken Tunisia shortly after landing had it been possible to mount a strong ground and air attack. The Luftwaffe was able to develop a number of airfields on the coastal plain of eastern Tunisia. The Luftwaffe had secure, all-weather bases in Sicily and Sardinia, as well as Sidi Ahmed, El Aouina, Sfax, Sousse, and Gabes in North Africa. The German ground forces also had the ability to inflict damage. Once Rommel was loose in the Allied rear areas, air superiority could not guarantee protection of the forward air bases. In November 1941, two forward RAF bases had to be evacuated under the guns of Rommel's tanks. (13.144)

The relationship between air and ground commanders diluted German efforts. A responsive, mutually, supporting headquarters was never established. The Luftwaffe's chain of command went from North Africa directly to Kesselring in Rome. Hitler emphasized close support for maneuvering ground forces in Africa. When Froelich went to Africa, he was told his main mission was "maximum support of the army units," not seizure of air

superiority. (13.154) While trying to resolve coordination problems, the Air Commander, Africa, continued to receive instructions from Kesselring which placed convey protection and close air support ahead of air superiority in mission priority. (13.154) On the other hand, the Casablanca Conference resulted in a unified command for all allied forces in the Mediterranean. The Northwest African Air Forces would pave the way for a unified effort to achieve overall air superiority.

Other factors working against air superiority were that, unlike the RAF, the Germans did not develop an effective tactical control intercept control systems or an effective aircraft reporting service. By late 1942, the latter deficiency was addressed by organizing fighters under a Jagdfliegerfuehrer (literally a fighter commander) whose specialized staff sent aircraft to attack RAF bases or intercept enemy fighters. Throughout the North African campaign, the Luftwaffe could not match the RAF's ability to move quickly. The smallest German fighter unit capable of shifting operations from base to base was the Gruppe, consisting of two to three squadrons totalling about 40 aircraft. During February, 1942, while Rommel advanced toward Egypt, the lack of squadron mobility caused the Germans to lose air superiority over Cyrenaica. (13.155) By spring, the balance of power was shifting against the axis, so that by October the British possessed an impressive numerical superiority. (19.127) In the period between November 1942 and May 1943, the Germans lost 2,422 aircraft in the theater (40.5 percent of their total

force structure as of November 10, 1942). (19.163)

Although different in scale, the Luftwaffe in North Africa, like in Russia, operated at the end of long lines of communication and faced enemy buildups with little prospect of reinforcement. This overextension on a multitude of fronts ensured that air superiority could not be achieved and sustained and represented a recipe for disaster. The Luftwaffe was placed in a position where it had to fight at a great disadvantage with a resulting high rate of attrition.

The Russian Front

As General Jeschonnek, Chief of the General Staff, put it, "At last a proper war." (24.254) Operation Barbarossa began on 22 June, 1941. Outnumbered more than two to one, the Luftwaffe depended on a heavy, surprise aerial blow to destroy as much of the Red Air Force as possible. The German air strategy was to defeat the Russian armed forces within four months so that Germany could once again turn its attention to Great Britain the following year. On the eve of Operation Barbarossa, The Luftwaffe had deployed 3,904 aircraft for the invasion. (16.38) By mid 1943 nearly 51 percent of the operational Luftwaffe would be committed to the eastern front. For long-range bombers and ground attack aircraft, this would remain the primary theater until the end of the war. The Red Air Force, even by their own estimates, lost 1200 aircraft on the first day, 800 of which on the ground. (13.177) Less apparent to the Luftwaffe was the survival of a large cadre of trained pilots. Nor was their

capacity to develop and deploy a new generation of aircraft seriously impaired. Russian planes continued to appear over the battlefield. Still, within a week the Red Air Force was deprived of most of its first-line operational combat aircraft and for three years, with the exception of the defense of Moscow in November and December, 1941, would not be a significant factor until late in 1942.

1943 marked the end of German aerial domination on the Russian front. After the battle at Kursk in July 1943 the German Army and Luftwaffe operated on the defensive and would have to content itself with surviving a war of attrition against the Red Army. Because of the vast geographic expanses, it was indeed not feasible to exert a pervasive and overwhelming command of the air over the entire Eastern front.

Consistent with other theaters, the Germans discouraged direct conflict with a defending fighting force except for self protection. Rather, the preference was to attack enemy air bases, which followed from the German propensity for offensive operations and to attack when they held the advantages of surprise and maneuver.

Luftwaffe squadrons were often reassigned on short notice to keep up with the advancing armor and mechanized infantry. The Soviet Air Force prevailed in the long struggle of attrition because Russian industry and training schools produced more airplanes and pilots than did Germany. As Adolf Galland put it, "It was as if one tried to exterminate a nest of ants by killing

them one by one without being able to get to their hill." (8.80) The Red Air Force depended on using many small, well concealed air strips. They were often so well prepared in advance of battle that they were unobserved by German reconnaissance. The Russians would keep their aircraft 50-100 miles behind front lines until the day before an offensive. They would then disperse forward to camouflaged areas to strike from these. The Germans relied far more on an organized, active defense. This was much more understandable to Western military thinking than Russia's practice of dispersal, replacement, and expenditure of lives and equipment. The German reliance on attacking air bases was thus negated to a degree.

Additionally, the Luftwaffe operated at the end of a long logistics line, couldn't replenish flying squadrons or send sufficient spare parts to service its fleet. The Germans were fighting an air war on three fronts: in Russia, the Mediterranean, and over Germany. The Germans eventually increased aircraft production but they could not produce enough fuel, guns, and other equipment, and the population was too small to replenish the lost divisions and pilots.

Europe

In June of 1943 the Allied Combined Chiefs of Staff issued a new policy to govern the strategic bomber offensive--the Pointblank directive. In it, German aircraft industry was elevated as a priority target as part of a campaign to maintain air superiority. Unescorted bombers could not gain the necessary

degree of air superiority over the Luftwaffe in being in order to attack Luftwaffe production facilities. The 17 August raids against Regensburg and Schweinfurt showed the potency of German Air defenses. 60 out of 230 bombers (10.3 percent) and 17.5 percent of the crews were lost. (1.166-168) A second attack against Schweinfurt on October 14 was even worse. The loss rate was 20.7 percent and the damage rate was 47.5 percent. This disaster at Schweinfurt forced Eaker to push drop tanks and fighter escorts to the top of his priority list.

The bomber offensive was thus able to achieve air superiority for its own operations mainly by applying larger numbers and carrying the air combat to Germany itself. The attrition kept the Luftwaffe from translating increased production into an enlarged frontline force. It also forced a continued decline in the quality of the German aircrew. Pilot shortages are reflected in the increased number trained. In 1942 5,299 were trained, whereas in 1943 12,164 were trained. (1.28) Training times were shortened from about 250 hours in 1939 to about 120 in 1943. In the end, less well trained pilots were being thrown into battle. By 1944, monthly aircraft losses were often higher from pilot error than to actual combat losses. (1.29)

By May 1944, the tactical air forces began systematic attacks on German airfields and maintenance facilities in France and continue through the fall of that year. Additionally massive air cover was provided for the landings. By August the Allies

had achieved virtual air supremacy. The preparations for the landings had cause great damage to German airfields, maintenance facilities, radar, and communications . Even when reinforced, the Luftwaffe could not use large forces effectively or persistently. Allied air superiority made a vital contribution to the success of Overlord.

In 1944, allied to Luftwaffe fighter losses were at an 8 to 1 ratio. (23.12) Combined bomber and fighter sorties were nearly 10 times as numerous as those by the Luftwaffe, indicating tremendous air superiority. (23.12)

After D-day, German aircraft production remained at a high level of about 2,500 per month until the end of the war. The aircraft production gap was highlighted by the numbers of aircraft produced in 1943: Allies produced 151,000 and the Axis powers 43,000. (20.20) However, allied bomber and fighter attacks kept about 70% of these flying for lack of fuel, spare parts, maintenance, and trained pilots.

Technology would also play a role. The Germans lagged other aviation powers in engine design and failed to mobilize its motor industry until well into the war, only managing to push it to half its peak capacity for all arms production. (15.40) In 1943 Albert Speer advised that engine crankshafts were the limiting factor to placing a higher priority on fighter production.

CONCLUSION

Despite the existence of L.Dv.16, Conduct of the Air War, there were no clear-cut doctrinal priorities established for the Luftwaffe. What evolved was a concept of strategic air warfare and an ill-defined notion of operational air war, neither of which could be fully executed because of shifting priorities, the necessity for direct support of ground forces, organizational constraints, and dilution of forces. The documents' vagueness provided commanders too much flexibility. It allowed them to change priorities frequently, as in the Battle of Britain, to dilute Luftwaffe assets, and to never fully appreciate the necessity of achieving and maintaining air superiority over the battlefield.

The brief and dazzling successes of the German armed forces in the west early in the war blurred any flaws in doctrine, organization, or operational practice. Throughout the war the Luftwaffe was unable to reconcile doctrinal preference with operational realities.

Clear German aerial victories ended with the defeat in the Battle of Britain. Prior to this attrition of the Polish Air Force occurred after its supply and communications were disrupted, in large part by the rapidly moving ground forces. In France and the Low Countries, Germany faced an enemy with divided command authority, WWI tactics, and, in the case of France, an enemy not prepared to fight offensively. Notably, the British achieved localized air superiority following unsuccessful attempts by the

Luftwaffe to destroy U.K. fighter bases. The early combat effectiveness of the Luftwaffe disguised the need to season doctrine and its air strategy until it was too late.

In the Battle of Britain, the Luftwaffe failed in part due to a vague air doctrine which had remained in tact as a result of the earlier quick victories. When results against the RAF did not materialize quickly, Goering shifted emphasis to bombing population centers. In North Africa, the Germans lacked both the air organization and warning services that could have given them an opportunity to challenge Allied air superiority. The Luftwaffe had failed to gain air superiority over great Britain and failed to maintain it in the Soviet Union. The defeat in the Battle of Britain was rationalized away by Luftwaffe planners to factors beyond their control. The constantly changing strategic directives made it easy to lay blame elsewhere. The performance of Rommel's Afrika Corps did not give the Luftwaffe an opportunity to fight the way it had been designed. Dispersal of the Luftwaffe's limited offensive strength to other fronts in 1941 and 1942 facilitated the attrition of the Luftwaffe. It went to war with a reasonably well equipped and balanced force. When Hitler attacked Russia in June 1941, he enlarged the war but failed to put the Luftwaffe on an appropriate production and training footing. This would not be undertaken until 1943. It would also require transfer of a large number of bombers from France and the Low Countries. The Luftwaffe of 1941/42 possessed virtually the same force structure

it possessed in 1939 and 1940 and found it virtually impossible to establish anything but local air superiority.

The tremendous production potential of Russia, badly underestimated before the war, allowed the Red Air Force to win by attrition. The Russians were able to counter German attacks by widespread dispersal, use of camouflage, antiaircraft artillery, and most of all by replacement of worn or damaged equipment which ended in success.

By the middle of 1943 the Germans faced enemy regional superiorities in the Mediterranean and on the Eastern front. The Americans had launched a campaign designed to achieve general air superiority by attacking the heart of the Luftwaffe and a determined campaign was in the planning stages to gain regional superiority over France in preparation for the landings. The best the Luftwaffe could do at this point was to rely on Reich air defenses and shift fighter resources to the battle area in France to resist the Ally attempt to gain air superiority. The Germans were forced to abandon their desired offensive counterair campaign for a defensive air-to-air battle. A telling story is that in May 1944, the Luftwaffe had a total strength in Russia, Southeast Europe, the Mediterranean, occupied Northwest Europe, and the Reich of 6,832 aircraft of all types. By contrast, the total allied forces based in the UK alone amounted to 12,617.

(22.fr 0432-5,fr.1050)

The conduct of the air war in WWII was conditioned by the performance of the aircraft industries. Evidence suggests it was

not a problem of strategic commitment but a problem of industrial efficiency and the effective utilization of resources. In the years 1940-42, Germany was capable of producing many more aircraft than it did. Germans were not fully committed to air defense. Hitler and Goering believed in the V-1 and V-2 revenge attacks as an effective response to the Combined Bomber Offensive.

The Germans waited until 1942 to begin a genuine mobilization, tainted by their belief in a short war. The combination of mass production and continual improvement in the quality of American, British and Russian aircraft and aircrews negated the German efforts.

The chief lesson of WWI was forgotten by the Germans, that the next war would be like a marathon, not a sprint.

At the time L.DV 16 was written fighters were not any faster than bombers. It was believed that defeating the enemy with overwhelming force in a lightning fashion was how best to protect friendly territory. (1.126) Dunkirk and the Battle of Britain demonstrated that the battle for air superiority would have to be fought fighter vs. fighter. Clearly, though the recipe of a devastating surprise attack was no longer valid against enemy who was prepared. A weakened Luftwaffe would be forced to fight for its life in precisely the type of defensive battle it sought to avoid. The most fundamental flaw with German air doctrine was not in the vagueness of its written doctrine. Rather, it was the inability to objectively evaluate the lessons of the various

campaigns. Pre-war assumptions remained so strong that real conditions of air warfare made relatively little impression. It should have been obvious from early on that something was substantially wrong with the rigid doctrinal approach.

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